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International Preliminary Examining Authority
European Patent Office
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Dear Sirs

International Patent Application No PCT/GB2004/004637

"Combustible Mosquito Coil or Stick"

Reckitt Benckiser (Australia) Pty Limited

In response to the Written Opinion dated 27 October 2005, we file herewith an amended set of claims to replace those currently on file. Manuscript amended pages are enclosed to assist the Examiner.

Referring to Paragraph V of the Written Opinion, the Examiner has acknowledged that all claims are novel because "None of the documents D2-D4 disclose combustible material for dispensing bifenthrin."

However, all of the claims are said to lack an inventive step in view of D2-D5.

The Examiner has stated that the subject matter of the claims have 2 relevant aspects, "the fact that bifenthrin is used in fumigators instead of the classical volatile pyrethroids and the formulation parameters".

We believe that these aspects as defined by the Examiner are not correct. Rather, the invention is directed towards the problem of providing a mosquito coil, which is safe for indoor use in the presence of humans, but is effective to kill mosquitoes rather than merely acting to knock the mosquitoes down.

Before considering each of D2-D5, it is important that the Examiner appreciates that there is a significant difference between devices that function as fumigators and mosquito coils. In particular, mosquito coils are typically used in a household environment, where due to the design and/or construction of the dwelling, mosquitoes are able to gain ready access to the interior of the dwelling. This ingress of mosquitoes will result in inhabitants of the dwelling being bitten, in the absence of any preventative measures or action taken by individuals to kill any mosquitoes attempting to bite. Such incidence of biting is of course more prevalent whilst the inhabitants are sleeping as they will unaware of being bitten and in any event, not able to take the requisite killing action against the mosquitoes.

One method of dealing with mosquitoes in the above described situation is through the use in such households of mosquito coils. Typically, a mosquito coil comprises a matrix which on combustion, emanates a substance into the atmosphere, the substance acting to minimise the extent of biting by any mosquitoes present. For the reasons outlined above, it is desirable that the mosquito coil is effective for a period of say 8 hours. Such a period is comparable with the usual duration of sleep for an individual. In this way, an individual will be protected from being bitten whilst they sleep.

It is inherent in the formulation of a mosquito coil that the nature and level of active must be both effective against mosquitoes and safe in use. In this context, safety refers to the minimisation of toxicity of the active on individuals.

By contrast, a fumigant formulation refers to a smoke generating composition which is combusted in a closed environment so as to produce a relatively high concentration of pesticidal active in that closed environment. See for example, D2 page 2 lines 1-12. A high concentration of active is generated to ensure that any insects in the fumigated environment will be killed. The nature and concentration from a human toxicity perspective are relatively unimportant since humans are not present in the environment during and subject to the fumigation treatment. See for example D4 page 2, lines 18-23 "That is to say that, it has the following advantages; the use of the smoke generator is extremely the time and labour saving method for applying agrochemicals to the target; since the worker can get out of the house immediately after igniting the smoke generator located in the greenhouse, he is free from poisoning by the agrochemicals;...".

With those differences in mind and faced with the problem of formulating a mosquito coil that was effective for killing mosquitoes whilst being safe to use in the presence of humans, a person skilled in the art would not consult fumigator related technology. As pointed out above, D4 specifically highlights the toxicity to humans in the use of smoke generators. D2 does not explicitly mention inherent toxicity but in relation to safety in use, the reference is to combustion temperature. See for example page 2 lines 11-12.

Moreover, a mosquito coil must combust at a relatively slow rate over a prolonged period of time, say 8 hours. During that time, an insecticidally effective concentration of active must be maintained in the room where the mosquito coil is combusted. However, the concentration must be non-toxic to humans. By contrast, a fumigation process requires the rapid generation of a relatively high concentration of active.

As was pointed out in our previous submission, the release rates of bifenthrin from D4 example 11 is 2352 mg/hr and for example 13 it is 7056 mg/hr. By contrast, the release rate for the present invention is no more than 12 mg/hr. That is about 1/200 th that of example 11. Such release rates would produce concentrations of actives at a level toxic to humans.

Accordingly it is submitted that neither D2 nor D4 can be used as a basis to conclude lack of inventive step.

The Examiner has stated that D3 "discloses the possible simultaneous use of such non volatile pyrethroids and even of bifenthrin". However, there is no disclosure, hint or suggestion to use bifenthrin alone in a mosquito coil. To emphasise this difference, claim 1 is amended, through the use of the language "consisting essentially", to the use of bifenthrin alone.

Moreover, there is no disclosure or suggestion that the compositions of D3 act to kill mosquitoes. See the examples, in particular Example 1 where knockdown alone is assessed and then only of the compound the subject of D3.

In relation to D5, it is noted that this paper deals with the insecticidal activity of permethrin and bifenthrin in fabrics treated with these compounds. In fact D5 investigates the effect on insecticidal activity of the washing of fabrics treated with permethrin or bifenthrin.

It is concluded the bifenthrin treated fabric retains greater activity on washing as compared with permethrin.

However, it is quite clear from the methodology of D5 that the insecticidal activity of bifenthrin and permethrin is evaluated by reference to contact between mosquitoes and the treated fabric. On page 276, third full paragraph, the authors disclose that they used the WHO "contact bioassay". Indeed even in the description of the "biting bioassay", it is evident that the mosquitoes are brought into contact with the test fabric.

A consideration of Table 1 (page 276 of D5) shows that at time 0, that is the insecticide treated fabrics had not been washed at all, the "Mort %" for fabrics treated with either permethrin or bifenthrin is the same (100%). Whilst it is true that after subsequent washing the bifenthrin appears more effective, such a finding is irrelevant to the problem to be addressed by the present invention.

According to the present invention, the problem to be solved is to provide an insecticidal mosquito coil that is effective to actually kill the mosquitoes. Thus such an insecticide must be effective in the vapour phase. In fact D5 shows that permethrin and bifenthrin are equally effective as contact insecticides. There is absolutely nothing in D5 to suggest that either bifenthrin is superior to permethrin (other than in fabric that has been repeatedly washed) or that bifenthrin would be a superior choice to permethrin in a mosquito coil. In fact there is no teaching whatsoever in relation to the vapour activity of these compounds.

We therefore submit that the Examiner's statement "...the skilled artisan would have selected bifenthrin as a known more efficient insecticide" is factually not derivable from D5.

Based on the foregoing, we believe that the amended claims define inventive subject matter over the cited documents D2, D3, D4 and D5. We therefore look forward to receiving a favourable International Preliminary Examination Report.

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Yours faithfully
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CLAIMS:

1. A combustible coil or stick for controlling mosquitoes, the coil or stick consisting essentially of a substrate and an insecticidally effective amount of bifenthrin, wherein
5 an oxygen supplier or accelerant is included in the coil or stick in an amount of from 0 - 1% w/w and the bifenthrin is present in an amount of about 0.002 - 0.6 % w/w, such that upon combustion of the coil or stick the bifenthrin is released at a rate of about 0.02 mg/h - 12 mg/h to control mosquitoes.
2. A combustible coil or stick for controlling mosquitoes, the coil or stick consisting
10 essentially of an insecticidally effective amount of bifenthrin in an amount of about 0.002 - 0.6 % w/w and a substrate that includes an oxygen supplier or accelerant in an amount of from 0 - 1% w/w, wherein the coil or stick is adapted to permit release of the bifenthrin from the coil or stick at a rate of about 0.02 mg/h-12 mg/h upon combustion of the coil or stick.
- 15 3. The combustible coil or stick according to claim 1 or 2 wherein the mosquitoes are controlled by killing.
4. The combustible coil or stick according to any one of claims 1-3 wherein the bifenthrin is released from the coil or stick at a rate of about 0.12 mg/h-3.75 mg/h.
5. The combustible coil or stick according to any one of claims 1-3 wherein the
20 bifenthrin is released from the coil or stick at a rate of about 0.3 mg/h-1.5 mg/h.
6. The combustible coil or stick according to any one of claims 1-5 wherein the bifenthrin is present in an amount of about 0.008-0.25 %w/w.
7. The combustible coil or stick according to any one of claims 1-5 wherein the bifenthrin is present in an amount of about 0.02-0.1 % w/w
- 25 8. The combustible coil or stick according to any one of claims 1-7 wherein the coil or stick has a weight of approximately 2-4 g.
9. The combustible coil or stick according to any one of claims 1-7 wherein the coil or stick has a weight of approximately 4-8 g.
10. The combustible coil or stick according to any one of claims 1-7 wherein the coil
30 or stick has a weight of approximately 8-16 g.
11. The combustible coil or stick according to any one of claims 1-7 wherein the coil or stick has a weight of approximately 10-20 g.
12. The combustible coil or stick according to any one of claims 1-7 wherein the coil or stick has a weight of approximately 12-24 g.
- 35 13. A combustible coil or stick for killing mosquitoes consisting essentially of a substrate and an insecticidally effective amount of bifenthrin , wherein an oxygen

supplier or accelerant is included in an amount of from 0 - 1% w/w and the bifenthrin is present in an amount of about 0.02-0.1% w/w, such that upon combustion of the coil or stick the bifenthrin is released at a rate of about 0.3 mg/h-1.5 mg/h to kill mosquitoes.

14. A combustible coil or stick for killing mosquitoes, the coil or stick consisting essentially of an insecticidally effective amount of bifenthrin in an amount of about 0.02 - 0.1% w/w and a substrate that includes an oxygen supplier or accelerant in an amount of from 0 - 1% w/w, wherein the coil or stick is adapted to permit release of the bifenthrin from the coil or stick at a rate of about 0.3 - 1.5 mg/h upon combustion of the coil or stick.
- 10 15. The combustible coil or stick according to any one of claims 1-14, wherein the substrate comprises a combustible fuel and a binder agent.
16. The combustible coil or stick according to claim 15 wherein the combustible fuel is selected from one or more of the group consisting of wood, sawdust, cardboard, coconut shell, leaves, nutshells, jute, sugarcane bagass, rice husks, tea and coffee refuse.
17. The combustible coil according to claim 15 or 16 wherein the binder agent is selected from one or more of the group consisting of starch, tamarind starch, tamarind kernal powder, guar gum and gum (joss) powder.
18. The combustible coil according to any one of claims 15-17 wherein the substrate further comprises one or more additives selected from the group consisting of emulsifying agents, retardants, preservatives, colouring agents and perfumes.
19. A combustible coil or stick for controlling mosquitoes consisting of:
 - 50-95%w/w combustible fuel material;
 - 5-40%w/w binding agent;
 - 25 0-1%w/w preservative;
 - 0-1%w/w oxygen supplier or accelerant;
 - 0-5%w/w retardant;
 - 0-5%w/w colouring agent;
 - 0-1%w/w perfume;
 - 30 0-1%w/w emulsifying agent;
 - 0.002-0.6%w/w bifenthrin.
20. A combustible coil or stick for controlling mosquitoes consisting of:
 - 35-40%w/w coconut shell;
 - 25-50%w/w wood powder;
 - 35 0.5-15%w/w gum (joss) powder;
 - 0-20%w/w tapioca starch;

0-0.5%w/w sodium benzoate;
0-1%w/w potassium nitrate;
0-1%w/w colouring agent;
0-1%w/w perfume;

5 0-10%w/w guar gum;
0-20%w/w tamarind starch;
0.008-2.6%w/w bifenthrin EC (23.34% bifenthrin).

21. A method for controlling mosquitoes, the method comprising burning a coil or stick according to any one of claims 1-20 so as to allow the bifenthrin to release from

10 the coil or stick into the atmosphere at a rate of 0.02 mg/h - 12 mg/h to control mosquitoes.

22. The method according to claim 21 wherein the bifenthrin releases from the coil or stick at a rate of about 0.12 mg/h - 3.75 mg/h.

23. The method according to claim 21 wherein the bifenthrin releases from the coil or

15 stick at a rate of about 0.3 mg/h - 1.5 mg/h.

24. A method of producing a combustible coil or stick according to any one of claims 1-20, the method comprising the steps of: a) providing a substrate that includes 0 - 1% w/w oxygen supplier or accelerant; b) combining an insecticidally effective amount of bifenthrin with the substrate; and c) shaping the substrate; wherein the substrate is

20 shaped before or after the addition of bifenthrin.

25. The method according to claim 24 wherein the method comprises the steps of:

- a) combining one or more combustible fuels, one or more binder agents and optionally one or more preservatives to form a dry mix;
- b) combining an insecticidally effective amount of bifenthrin with an

25 emulsifying agent to form an emulsified bifenthrin concentrate;

- c) forming a dispersion of emulsified bifenthrin in water;
- d) adding the dispersion of emulsified bifenthrin to the dry mix with mixing to form a dough;
- e) shaping the dough into coils or sticks; and

30 f) drying the coils or sticks.

26. A method of producing a combustible stick according to any one of claims 1-20, the method comprising the steps of: a) providing a stick adapted to receive a substrate; b) providing a substrate that includes 0 - 1% w/w oxygen supplier or accelerant; c) combining an insecticidally effective amount of bifenthrin with the substrate; and d)

35 applying the substrate to the stick; wherein the substrate is applied to the stick before or after the addition of bifenthrin.

27. The method according to claim 26, the method comprising the steps of:
 - a) providing a stick and optionally coating the stick with an adhesive agent;
 - b) providing a substrate comprising a combustible fuel material and binding agent;
 - 5 c) applying the substrate to the stick by rolling the stick in the substrate; rolling thin sheets of the substrate around the stick; or extruding or moulding the substrate around the stick;
 - d) dipping the stick in or spraying the stick with a solution containing bifenthrin and optionally perfume.
- 10 28. The method according to claim 27 wherein the adhesive agent is gum or glue.
29. Use of an insecticidally effective amount of bifenthrin in a combustible coil or stick for controlling mosquitoes, wherein the coil or stick includes 0 - 1% w/w oxygen supplier or accelerant and 0.002-0.6% w/w of bifenthrin is impregnated within and/or coated onto the coil or stick.
- 15 30. The method of any one of claims 24 - 28 or the use according to claim 29 wherein the bifenthrin is present in an amount of about 0.008 – 0.25 %w/w.
31. The method of any one of claims 24 - 28 or the use according to claim 29 wherein the bifenthrin is present in an amount of about 0.02 - 0.1 % w/w.

CLAIMS:

1. A combustible coil or stick for controlling mosquitoes, the coil or stick
consisting essentially of
comprising a substrate and an insecticidally effective amount of bifenthrin,
5 wherein an oxygen supplier or accelerant is included in the coil or stick in an amount of from 0 - 1% w/w and the bifenthrin is present in an amount of about 0.002 - 0.6 % w/w, such that upon combustion of the coil or stick the bifenthrin is released at a rate of about 0.02 mg/h - 12 mg/h to control mosquitoes.
- 10 2. A combustible coil or stick for controlling mosquitoes, the coil or stick
consisting essentially of
comprising an insecticidally effective amount of bifenthrin in an amount of about 0.002 - 0.6 % w/w and a substrate that includes an oxygen supplier or accelerant in an amount of from 0 - 1% w/w, wherein the coil or stick is adapted to permit release of the bifenthrin from the coil or stick at a rate of about 0.02 mg/h-12 mg/h
15 upon combustion of the coil or stick.
3. The combustible coil or stick according to claim 1 or 2 wherein the mosquitoes are controlled by killing.
- 20 4. The combustible coil or stick according to any one of claims 1-3 wherein the bifenthrin is released from the coil or stick at a rate of about 0.12 mg/h-3.75 mg/h.
5. The combustible coil or stick according to any one of claims 1-3 wherein the
25 bifenthrin is released from the coil or stick at a rate of about 0.3 mg/h-1.5 mg/h.
6. The combustible coil or stick according to any one of claims 1-5 wherein the bifenthrin is present in an amount of about 0.008-0.25 %w/w.
- 30 7. The combustible coil or stick according to any one of claims 1-5 wherein the bifenthrin is present in an amount of about 0.02-0.1 % w/w

8. The combustible coil or stick according to any one of claims 1-7 wherein the coil or stick has a weight of approximately 2-4 g.
9. The combustible coil or stick according to any one of claims 1-7 wherein the coil or stick has a weight of approximately 4-8 g.
10. The combustible coil or stick according to any one of claims 1-7 wherein the coil or stick has a weight of approximately 8-16 g.
- 10 11. The combustible coil or stick according to any one of claims 1-7 wherein the coil or stick has a weight of approximately 10-20 g.
12. The combustible coil or stick according to any one of claims 1-7 wherein the coil or stick has a weight of approximately 12-24 g.
- 15 13. A combustible coil or stick for killing mosquitoes comprising a substrate and an insecticidally effective amount of bifenthrin, wherein an oxygen supplier or accelerant is included in an amount of from 0 - 1% w/w and the bifenthrin is present in an amount of about 0.02-0.1% w/w, such that upon combustion of the coil or stick the bifenthrin is released at a rate of about 0.3 mg/h-1.5 mg/h to kill mosquitoes.
- 20 14. A combustible coil or stick for killing mosquitoes, the coil or stick comprising an insecticidally effective amount of bifenthrin in an amount of about 0.02 - 0.1% w/w and a substrate that includes an oxygen supplier or accelerant in an amount of from 0 - 1% w/w, wherein the coil or stick is adapted to permit release of the bifenthrin from the coil or stick at a rate of about 0.3 - 1.5 mg/h upon combustion of the coil or stick.